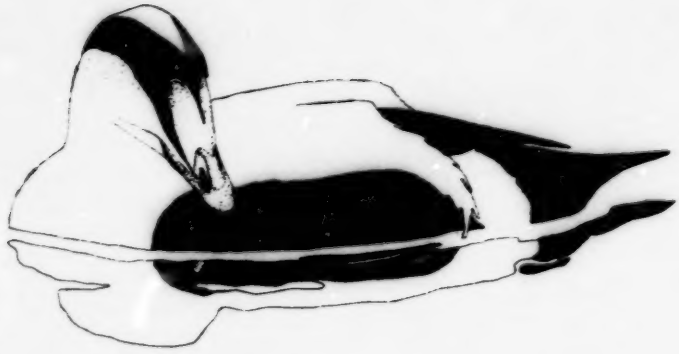
MARINE BIRD OBSERVATIONS AT PLACENTIA BAY AND CAPE ST. MARY'S, 1973-1976

W. Threlfall
R. I. Goudie



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MARINE BIRD OBSERVATIONS AT PLACENTIA BAY AND CAPE ST. MARY'S, 1973-76

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Abstract

Counts of marine birds, made at monthly intervals in 1973-76 at 13 sites spaced along the Placentia Bay coast in southeastern Newfoundland, revealed patterns of distribution and numbers through the year. The Cape St. Mary's area (46°50'N, 54°12'W) received the most use, especially by eiders and murres in winter and spring, and by the breeding gannets, murres and kittiwakes in summer. The Argentia area (47°15'N, 54°00'W) was heavily used by shearwaters in summer and by Dovekies in winter. Large gulls were more evenly distributed than most species, but concentrated at Cape St. Mary's in fall and winter. No species was concentrated at the intervening (Cape Shore) observation sites, which received generally light use.

Résumé

Le dénombrement des oiseaux de mer qui s'est effectué à des intervalles d'un mois de 1973 à 1976 dans 13 emplacements situés sur la côte de la baie Placentia au sud-est de Terre-Neuve a révélé la distribution et les quantités d'oiseaux présents tout au long de l'année. La région de Cape St. Mary's (46°50'N, 54°12'O) a été la plus fréquentée notamment par les eiders à duvet et les marmettes l'hiver et le printemps, et par les fous de Bassan, les marmettes et les mouettes, tous trois en période de nidification pendant l'été. La région d'Argentia (47°15'N, 54°00'O) était beaucoup fréquentée par les puffins l'été et les mergules nains en hiver. De grands goélands étaient répandus plus uniformément que la plupart des autres espèces, mais ils se concentraient à Cape St. Mary's en automne et en hiver. Il n'y avait aucune concentration d'espèces aux sites intermédiaires d'observation, soit ceux de la région de Cape Shore qui sont généralement assez peu fréquentés.

Introduction

Industrial developments in the Placentia Bay area, and particularly the Come-by-Chance oil refinery and the Long Harbour phosphorus smelting plant, triggered a series of environmental studies by researchers at Memorial University of Newfoundland in the early 1970's. Their work was aimed at predicting, and possibly mitigating, negative environmental impacts of the developments. During June 1973 - May 1976, the senior author directed a quantitative study of marine birds in Placentia Bay to determine seasonal species composition, distribution, movements within and use of the area by these birds. The study was subdivided into pelagic boat-based surveys and inshore coastal counts; the latter results are presented in this paper.

Little has been published about overall marine bird use of specific areas in Newfoundland, such as Placentia Bay. Goudie (1981) reported on winter use inshore in the Placentia to St. Mary's Bay area using a study approach similar to that reported here. Other studies have focused on specific breeding sites and pelagic concentrations (e.g. Brown et al., 1975).

Methods

One observer, using a 20-60X zoom spotting scope, identified and counted birds at each of 13 observation points, with observations averaging 20-30 minutes. We estimated that the radius of effective coverage, in which we assumed that all birds were recorded, extended to 1 km from the points of observation which were an average of 100m above sea level (Fig. 1). Observations took place as weather permitted, and intervals between surveys varied, although 3 visits were attempted for each month. All observations at sites A-M were made between 0900 and 1700h. High winds and fog occasionally interfered with or prevented observations, with fog being more prevalent towards Cape St. Mary's. Data were analysed only from surveys with complete 1 km radius coverage.

Observations were extrapolated to estimate use and potential populations of marine birds in a 1.0 km belt of water along the entire coastal area sampled (Fig. 1). Marine bird use, calculated as monthly bird-days (mean number of individuals x days in month), was compared by season. Average seasonal use of the inshore study area was estimated by summing monthly bird use.

Percentage coefficients of variation (i.e. standard deviation/mean x 100) were calculated for species or species groups, and values less than 100 percent reflected greater predictability of encountering given species. As well, the coefficient indicated the variability of numbers encountered. Species for example, which were pelagic and only occasionally seen inshore had high coefficients of variation. Species more predictably encountered during the season when they are resident displayed coefficients less than 100%.

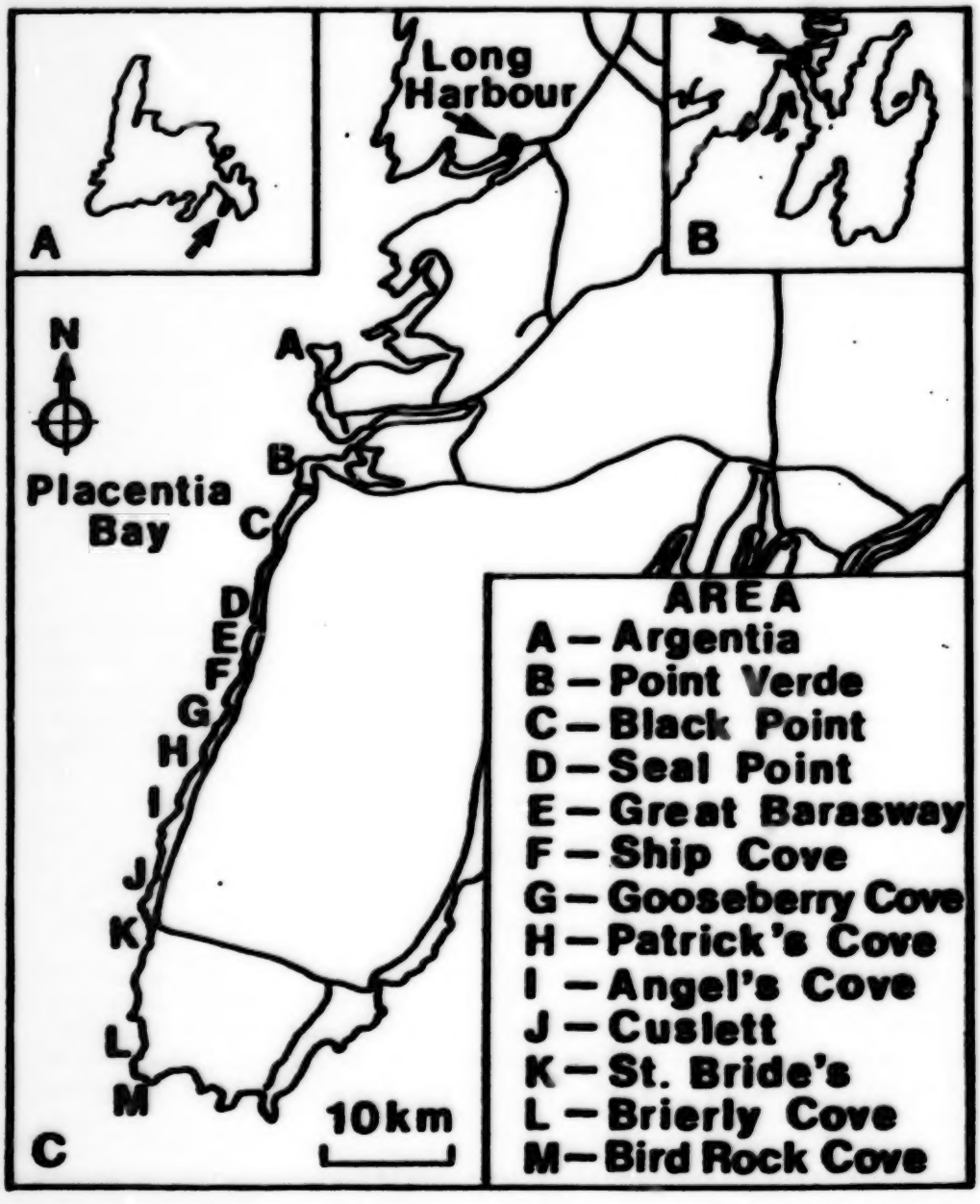

Figure 1 Placentia Bay study area.

Results

The opportunistic observations with small sample sizes per site resulted in highly variable data when compared from year to year. Many factors, such as weather, tides and human activity, affect the numbers and distribution of marine birds in this area. To reduce the effect of this variation, extrapolations were based on data pooled for the three years. The more detailed annual data are available from the authors.

Three distinct geographic units were distinguished on the basis of physiography, location, and associated marine bird use (Fig. 1):

1) Argentia Peninsula sites (A,B) - located where Placentia Bay narrows to channels among the islands. This area of low-lying peninsulas and river estuaries is the least weather-exposed of the three sections.

2) Cape Shore sites (C-K) - a regular shoreline of exposed bedrock points and shallow coves with cobble beaches.

3) Cape St. Mary's sites (L-M) - Cape St. Mary's area at the extreme southwest tip of the Avalon Peninsula is noted for its precipitous dissected shoreline exposed to high wave energy. This section harbours the renowned gannetry, as well as colonies of Common Murres (Uria aalge) and Black-legged Kittiwakes (Rissa tridactyla) (Brown et al., 1975).

Extrapolated use of the study area, expressed as marine bird-days, is summarized in Table 1. We extrapolated marine bird use to the entire inshore zone between sites A and M. Loons (Gavia immer and G. stellata) were present throughout the year and study area. The latter species was not observed at sites A-B. Grebes (mainly Podiceps grisegena, with a few P. auritus) were uncommon but present each year in winter and spring, mainly in the shallow coves along the Cape Shore (sites C-K).

Shearwaters (Puffinus gravis, P. griseus) were strictly seasonal, appearing only in summer but sometimes in large numbers, and primarily off the Argentia Peninsula (site A). Manx Shearwaters (P. puffinus) have bred since 1977 on Middle Lawn Island off the Burin Peninsula (Lien et al., 1978). Storm-Petrels (Oceanodroma leucorhoa, Oceanites oceanicus) were observed in low numbers along the Cape Shore (C-K) in fall and spring.

Northern Gannets (Sula bassanus) and cormorants (Phalacrocorax carbo, P. auritus) breed in the Cape St. Mary's and Cape Shore areas, and are largely absent (except for a few P. carbo) during the winter. The Cape St. Mary's area is an established breeding site for murres (U. aalge plus a few U. lomvia) with lesser numbers of Black Guillemots (Cepphus grylle) and Razorbills (Alca torda). Black Guillemots winter locally, as do Dovekies (Alle alle), whereas Razorbills and murres were

Table 1. Extrapolated marine bird use of the entire inshore area between sites A and M.

	Winter (October-April)				Summer (May-September)			
	Sites A-B	Sites C-K	Sites L-M	Total	Sites A-B	Sites C-K	Sites L-M	Total
Loons	570	900	1050	2520	30	580	150	760
Red-necked Grebe	140	1030	150	1320	-	80	-	80
Northern Fulmar	-	-	-	-	30	330	600	960
Storm-Petrels	30	40	-	70	-	490	-	490
Shearwaters	-	-	-	-	232750	5130	300	238180
Northern Gannet	310	1140	14450	15900	1270	3040	("B") (54500)	58810
Cormorants	30	530	9030	9590	110	1230	-	1340
Common Eider	4640	37220	883700*	925560	30	10380	37490	47900
Harlequin Duck	60	40	3460	3560	-	-	150	150
Oldsquaw	9950	3740	16710	30400	90	900	150	1140
Scoters	620	2090	67440	70150	170	210	14000	14380
Mergansers	2180	1190	750	4120	90	250	-	340
Phalaropes	20080	3320	2410	25810	2430	1190	150	3770
Other Waterfowl[1]	1020	490	-	1510	30	40	-	70
Pomarine Jaeger	-	-	-	-	90	-	150	240
Large Gulls	25390	9690	110050	145130	22930	18390	211210	252530
Black-legged Kittiwake	3730	3980	405710	413420	13520	37180	("B") (513340)	564040
Terns	-	-	-	-	1470	80	-	1550
Dovekie	480	700	1050	2230	-	-	-	-
Murres	1050	530	339170	340750	3370	1350	("B") (205640)	210360
Razorbill	-	-	-	-	30	120	2410	2560
Black Guillemot	960	1190	6620	8770	540	1930	20780	23250
Atlantic Puffin	230	530	-	760	30	1270	3910	5210
Other[2]	-	120	-	120	30	-	-	30
Total	71470	68470	1861750	2001690	279040	84170	1064930	1428140
Surveyed Area	743ha	990ha	185ha	1918ha	743ha	990ha	185ha	1918ha
Total	2101ha	4063ha	2785ha	8949ha	2101ha	4063ha	2785ha	8949ha

[1] Includes Common Goldeneye, Black Duck, Greater Scaup, Canada Goose, and Brant

[2] Bald Eagle and Osprey

"B" - Breeding, see Brown et al. (1975). Corresponding bracketed figures represent extrapolations based on birds present on water within the area covered.

* - Based on adjusted value - see Appendix 1.

virtually absent inshore from early fall to February (see Brown et al., 1975).

Black-legged Kittiwakes (R. tridactyla) breed in large colonies around Cape St. Mary's during spring and summer. Outside the breeding season kittiwakes are pelagic (Cramp and Simmons, 1983), a habit reflected in the low use of the study area by this species from September to February. Large gulls (primarily Larus marinus, L. argentatus) were resident throughout the year but were more numerous in summer. Pomarine Jaegers (Stercorarius pomarinus) and terns (Sterna hirundo, S. paradisaea) were observed in small numbers in spring and summer at the Cape Shore (sites C-K) and Argentia Peninsula, and were absent in fall and winter. Phalaropes (Phalaropus lobatus, P. fulicarius) were present from fall through to spring, and were particularly abundant in February 1976 around the Argentia Peninsula (sites A-B).

The large numbers of breeding alcids and kittiwakes were approached in magnitude only by the wintering seaduck populations made up of Common Eiders (Somateria mollissima), scoters (primarily Melanitta nigra), Oldsquaws (Clangula hyemalis), Harlequin Ducks (Histrionicus histrionicus), and mergansers (primarily Mergus serrator). Mergus merganser seemed to prefer the inner reaches of the bay. Seaduck use was concentrated around Cape St. Mary's, with a secondary but substantial concentration of Oldsquaws and mergansers in the Argentia area. Canada Geese (Branta canadensis), American Black Ducks (Anas rubripes), Greater Scaups (Aythya marila), and Common Goldeneyes (Bucephala clangula) were more abundant in the latter area (Table 1).

Uncommon species were excluded from Table 1. Glaucous Gulls (L. hyperboreus), Iceland Gulls (L. glaucoides), Black-headed Gulls (L. ridibundus) and Ivory Gulls (Pagophila eburnea) were uncommon in fall, winter. and spring and absent in summer. Brant (Branta bernicla), a vagrant in Newfoundland, was observed once in May 1976 in the Great Barasway area (site E).

Species Use Variability

Seasonal and locational trends varied among species groups. Percentage coefficients of variability (Table 2) provided a rough measure of residency and/or variability in numbers. Thus, seaduck presence was erratic in summer to fall (high coefficients), but relatively stable in winter and spring (generally less than 100%). Other species groups, such as the Northern Gannet, cormorants and alcids (excluding Black Guillemot), showed an opposite trend with resident usage and low coefficients in spring and summer. Only large gulls, Black Guillemots, and loons were predictably resident throughout the year, and hence had consistently low coefficients of variability. A subjective comparison of our data to those presented for winter 1978-79 by Goudie (1981) indicated that seaduck usage of the study area may have declined somewhat in recent years. This interpretation was

Table 2. Percentage coefficients of variation* of marine birds observed at Placentia Bay & Cape St. Mary's, 1973-76, grouped by season and area.

Species (group)	June-August			Sept-Nov.			Dec-Feb.			March-May		
	A-B	C-K	L-N	A-B	C-K	L-N	A-B	C-K	L-N	A-B	C-K	L-N
Loons	-	60	-	67	164	-	86	48	300	70	49	18
Red-necked Grebe	-	-	-	160	167	-	150	60	-	42	126	-
Storm-Petrels	-	164	-	167	167	-	-	-	-	120	-	-
Shearwaters	104	76	141	-	-	-	-	-	-	-	173[1]	-
Northern Gannet	89	43	97	160	100	118	-	-	-	118	95	52
Cormorants	82	38	8	164	91	43	-	-	-	150	133	-
Common Eider	200	180	-	171	235	159	96	84	15	33	53	42
Harlequin Duck	-	371	-	171	167	409	-	167	52	-	200	-
Oldsquaw	-	-	-	57	132	-	134	86	21	117	113	64
Scoters	419	197	-	182	166	123	63	9	64	106	82	64
Mergansers	-	200	-	-	200	-	40	123	167	22	36	369
Phalaropes	-	-	-	131	148	-	199	107	298	200	124	150
Jaegers	29	149	-	-	-	-	-	-	-	217	-	173
Large Gulls	19	21	27	28	63	4	147	25	229	18	18	75
Black-legged Kittiwake	14	40	55	146	123	-	-	-	-	85	108	294
Terns	113	164	-	145	-	-	-	-	-	143	-	-
Dovekie	-	-	-	-	164	161	173	123	29	-	150	-
Murres	7	135	30	168	140	-	122	121	141	150	173	5
Razorbill	150	164	103	-	-	150	-	-	-	-	-	100
Black Guillemot	39	55	34	155	125	148	132	98	31	63	92	18
Atlantic Puffin	173	150	133	171	125	-	-	-	-	-	-	173

*CV = Standard deviation/mean x 100

[1] including the Manx Shearwater

complicated by the uneven sampling effort for Cape St. Mary's (L-M) discussed in the next section. Goudie (1981) observed much larger inshore concentrations of murres and kittiwakes in February and March, and this may have been related to an early spring in 1978-79. Use by large gulls appeared to have increased substantially by winter 1978-79. Use by other groups such as loons and guillemots appeared fairly stable. It is not known whether the populations recorded in winter are the same birds that breed in this area although this is possible for species such as Herring Gulls and Black Guillemots. The seaducks are thought to originate elsewhere, especially in Labrador-Ungava and the eastern Canadian Arctic, as was shown for Common Eiders by Gillespie and Learning (1974). Shearwaters were the most seasonal species, and with jaegers, storm-petrels, and phalaropes, were unpredictable even when present.

Marine bird use expressed as bird days (Table 1) and populations (Table 3) supported the conclusion reached by Goudie (1981), that the area off Cape St. Mary's (sites L & M) is the most important in terms of seabird use. The Argentia Peninsula (sites A & B), not included by Goudie (1981), appeared somewhat more important to seabirds than the Cape Shore. The concentrations of large gulls, Oldsquaws in winter, and shearwaters in summer were notable in this area (sites A & B).

Discussion

The marine bird usage of the inshore zone of Placentia Bay is characterized by gannet-alcid-gull breeding concentrations in summer, and by winter seaduck assemblages. These data help to complete the picture of marine bird use of the inshore area through the year. As suggested by Goudie (1981), the Cape St. Mary's area is the most important for marine birds within the study area. However, the coverage in 1973-76 placed less emphasis on that site, with more detailed coverage occurring further in the bay where oil spills and subsequent environmental damage were considered more likely to occur.

Use by some species was considerably less than that reported by Goudie (1981) for the Cape St. Mary's area (sites L & M). For some resident species such as gulls the increasing trend may be realistic but for others, such as eiders, it probably reflected the degree of coverage (185 ha/visit average 1973-76 compared to 469 ha/visit in 1978-79). Furthermore, only 48% of visits to the L and M sites in 1973-76 had coverage of both sites. Brierly Cove (site L) was covered more often (33%) than Bird Rock Cove (site M) (19%) during incomplete surveys. Species such as eiders and kittiwakes were consequently less well sampled in 1973-76, as considerably larger numbers are known to frequent the Bird Rock Cove area than Brierly Cove (Goudie, 1981). Adjusted values and calculations for eiders are presented in Appendix 1. The populations of eiders based on that adjustment are very similar to those of Goudie (1981) (4080 versus 4030), and probably more accurately reflect the bird use of that area.

Table 3. Extrapolated mean populations of some marine birds for the entire coastal area between sites A and M.

Species (group)	June-August			Sept-Nov.			Dec-Feb.			March-May		
	A-B	C-K	L-M	A-B	C-K	L-M	A-B	C-K	L-M	A-B	C-K	L-M
Loons	-	4	-	2	4	-	2	4	8	+[3]	4	6
Red-necked Grebe	-	-	-	+	+	-	+	4	-	2	4	-
Shearwaters	2584	57	3	-	-	-	-	-	-	-	+	-
Northern Gannet[1]	6	20	345	2	12	340	-	-	-	6	16	153
Cormorants	+	8	28	+	12	6	-	-	-	+	4	-
Common Eider[2]	+	+	-	+	4	3	34	146	6636	19	345	3115
Harlequin Duck	-	-	-	+	+	17	-	+	22	-	8	-
Oldsquaw	-	-	-	8	4	-	155	24	125	59	20	64
Scoters	+	4	-	+	4	139	4	20	228	6	4	1604
Red-breasted Merganser	-	+	-	-	+	-	8	4	+	13	12	6
Phalaropes	-	-	-	2	36	-	237	4	11	25	+	+
Large Gulls	155	126	159	172	154	1532	183	20	1122	179	69	493
Black-legged Kittiwake[1]	137	370	5459	6	24	-	-	-	-	179	49	3064
Dovekie	-	-	-	-	+	6	1183	8	6	-	+	-
Murres[1]	32	4	2117	2	4	-	11	32	1260	6	4	2660
Black Guillemot	4	12	201	+	4	33	2	4	28	4	12	47

[1]Northern Gannets, Black-legged Kittiwakes, and Murres (both spp.) breed in the Bird Rock Cove area in spring-summer. For breeding population size see Brown et al. (1975). The numbers shown here represent only those seen within the coverage area during the 20-30 minute scans. We focused only on those on the water or flying within the covering unit. Birds on nests and ledges were not included.

[2]Common Eider adjusted to correct for uneven sampling effort for sites L-M. See Appendix I.

[3]average <1

Concentrations of seabirds off marine headlands are most likely correlated with high marine productivity in the area associated with shallow inshore waters and high turbulence, causing continuous mixing and cycling of nutrients (see Steele, 1983). Such dissected headlands also provide protection from winds and waves from virtually any direction. Other studies suggested major differences between the Cape St. Mary's and inner bay benthic communities (Osbourne and Swiss, 1982; Ryan, 1985).

The appearance of waterfowl other than seaducks (tribe Mergini) in the upper part of the bay reflected boreal and estuarine influences which are more important in this sheltered area. The large concentrations of the pelagic shearwaters and phalaropes off the Argentia Peninsula (site A) are likely attributable to the projection of the headland into the pelagic zone.

Provincial and Regional Perspective

Loons and grebes occurred, primarily in winter, in low densities typical of these species throughout the region. The few summer individuals were likely non-breeders. The Common Loon is present in all seasons in Newfoundland whereas the Red-throated Loon occurs as a winter species, although it breeds on St. Pierre and Miquelon (Tuck and Borotra, 1972; Etcheberry, 1982). The Red-necked Grebe is uncommon in Newfoundland and is strictly a wintering species. Some of the largest known wintering concentrations in the northwest Atlantic occur nearby in St Pierre and Miquelon (400-600; A. Desbrosse, in litt.).

The headlands of Cape St. Mary's support large colonies of breeding seabirds during summer and early fall. The "Bird Rock" is the site of the second largest of the six gannet colonies in the northwest Atlantic (Nettleship, 1976). Cape St. Mary's also is the fifth largest Common Murre colony among about 20 major breeding sites in the northwest Atlantic (Brown et al., 1975). The Black-legged Kittiwake colony is about the fourth largest of more than a dozen major colonies in the western Atlantic Region.

Other species of marine birds which breed along the headlands of Cape St. Mary's, in low numbers, are the Razorbill, Black Guillemot, Thick-billed Murre, Double-crested Cormorant and Great Cormorant (Brown et al., 1975). These species are generally absent from the inshore zone in winter except for Black Guillemots and a few Great Cormorants. In winter, Dovekies originating from Arctic colonies are periodically abundant.

Large gulls are common inshore in all seasons. This has been accentuated by the availability of fish offal during the seasonal fishery, and by man-created garbage year-round. In general these species have experienced a population explosion, and are now considered by some to be "pest" species, particularly in areas where they are believed to cause damage to more specialized species (e.g. terns, puffins, eiders).

In winter, inshore use of Cape St. Mary's and eastern Placentia Bay is dominated by seaducks (tribe Mergini), particularly the Common Eider. Cape St. Mary's appears to be an area of major importance for wintering eiders in coastal Newfoundland (Goudie, 1981). Furthermore, the winter population of Harlequin Ducks (approximately 100-200 individuals) is one of the largest of the few known for the region. The wintering population of Black Scoters (approximately 500 individuals) is the largest known for the province. It appears that favorable marine conditions and relative inaccessibility render Cape St. Mary's a site of unique provincial and regional significance for wintering seaducks.

Susceptibility to Ecological Disasters

The importance of Placentia Bay to marine birds suggests that the area would be highly sensitive to pollution by oil or other toxins, with potential for an ecological disaster. Placentia Bay is presently an important shipping zone for the Argentia Naval Base and the ERCO phosphorus smelting plant at Long Harbour. Traffic likely will increase with the construction of planned offshore oil exploration supply bases, as well as possible re-activation of the Come-by-Chance oil refinery. Furthermore, several shipping routes converge off the extremely sensitive Cape St. Mary's area. During periods when thousands of seabirds concentrate in this area, populations could be devastated by a spill of crude oil. Many species of this seabird assemblage spend a large portion of their time on the ocean surface which increases their susceptibility to floating toxic pollutants. Incidental contamination results from the present indiscriminate flushing of bilges and tanks of vessels. High chronic levels of oiling of seabird corpses collected on beached-bird surveys in this area in winter have likely originated from these sources (see Threlfall and Piatt, unpublished). Land-based disturbances are less threatening, as the area of seabird breeding concentrations is encompassed within a provincial sanctuary. However, water-based activities such as the location of tanker routes and commercial fishing operations need further consideration if potential impacts are to be minimized.

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Appendix 1. Adjusted Common Eider estimate for the Cape St. Mary's headland area.*

Month	Year	Site H Monthly mean no. (coverage 93 ha)	Marine Bird Days	Extrapolated Population	Extrapolated Marine Bird Days
Dec.	1975	144	4464	6501	201531
Jan.	1974	164	5084	7313	226703
Feb.	1974 & 1976	136	4216	6095	170660
Mar.	1976	100	3100	4469	138539
Apr.	1975 & 1976	107	3210	4876	146280
Total (winter)		130 ± 26.5	20074	29254	883713

Mean winter population, i.e. October to April (1974-76)

29254/7 = 4179 ± 3011 (s.d.)

*Observations by Goudie (1981) suggested most eiders concentrated outside the Brierly Cove site (site L), so we derived our estimate from site H data only, as coverage was unevenly distributed between sites L & H.